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Summer in the City: East Meets West

Tan Aik Ling is learning to shop for fruits and vegetables in New York. She examines one unfamiliar root and shoot after another. No juicy mangosteens in leathery, eggplant-colored skins. No durians, the lumpy, football-sized fruit that Singaporeans say tastes like heaven and smells like h***.

Finally she buys a cabbage. It's the only thing I recognized, she explains.

"Igor Kiselev is learning gene array technology."

Tan, whose first name is pronounced Egging, has taught biology to 9th and 10th graders in the island country of Singapore for eight years. She's in New York this summer, sponsored by the Singapore Ministry of Education, looking for ways to make the subject matter more interesting to her students. She's finding new ideas in teaching and writing seminars run by Science Outreach, an HHMI-supported program at The Rockefeller University, and in her work in Nam-Hai Chua's plant molecular biology laboratory there.

Igor Kiselev is also spending the summer studying and doing lab work at Rockefeller, but this is a return visit for the high school biology teacher from Moscow. He was selected from many applicants after a video conference between HHMI and Moscow convinced Rockefeller's HHMI program director Bonnie Kaiser that teachers in Russia face the same kinds of challenges as New York City teachers. Kiselev spent last summer at Rockefeller, taking workshops with American teachers and working in a gene array lab. This year he's working on a new project: a four-color labeling system for microarray slides.

2001 was a summer of firsts: the first time Kiselev had ever crossed the Russian border and the first time Rockefeller's Science Outreach program had ever imported a teacher. It's hard to say who benefited more.

I use the principles I learned at Rockefeller to teach my students to design experiments and report results, says Kiselev. I learn so much by seeing and working on the latest equipment and techniques, by being around people who are doing this amazing science. For example, he says, I had read about PCR (polymerase chain reaction), but before I got here, I had never done it or seen

it done. PCR is one of the most important techniques in molecular biology, and now I can tell my students and colleagues exactly what is a PCR and how it works.

In Russia, Kiselev explains, high school teachers and students don't have access to sophisticated laboratory equipment or current textbooks and journals. Our books and magazines are from the 1980s, he says. Our experiments are on the macro level: germination of seeds, studying single-celled organisms. My educational technology is chalk and a blackboard. I am trying to prepare my students to do 21st century science with 20th century tools.

At the Second School Lyceum, a science and math high school for 7th through 11th grades, Kiselev and fellow teachers built their own television set so they could use videos in class. Next year, HHMI will provide him with a DVD player and DVDs of the annual Holiday Lectures on Science by HHMI investigators.

In Singapore, Tan has the technology. In well-equipped labs at River Valley High School, she still needs ways to motivate her students toward careers in science. We are almost four million people living on an island 14 miles wide and 25 miles long, she says. We have no natural resources but our minds. We must develop a knowledge-based economy.

Tan had never worked in plant genetics. This summer, with her mentor, Nandini Krishnamurthy, Tan is studying genes in *Arabidopsis* that might play a role in cell death. They are investigating whether the mechanism of cell death may be regulated by genes that have some sequence similarities in plants and animals.

I teach basic botany, not plant physiology and genetics, says Tan. This work is bringing me way out of my comfort zone, but that's where all the learning takes place. The more hands-on experience I get, the better my teaching will be.

Tan is the first person Krishnamurthy has mentored. Despite the time it takes to show her what to do and how to do it, the Rockefeller postdoctoral fellow likes having the teacher around. I like teaching, and she's a fast learner, Krishnamurthy says. If she inspires just one student to go on in science because of something she learned here, it will all have been worthwhile.

Gregory Khitrov, director of Rockefeller's Gene Array Resource Center, initially was less enthusiastic when Kiselev arrived in his lab last year. I actually didn't want anyone, he admits. I was just getting the center up and running, and I didn't know what to do with him.

But they were fellow Russians; Khitrov emigrated from Uzbekistan with his family in 1990. So he welcomed Kiselev, and it didn't take the teacher long to find a niche. He actually helped us quite a lot, says Khitrov. He was able to break boundaries and help us use our facility to develop labeling and hybridization techniques that everyone at Rockefeller now uses.

Both foreign teachers have found time for new adventures outside the lab too. Tan went kayaking on Long Island Sound with one of the American teachers in her seminar. One benefit of the program is the friendships that develop, she says. These friendships are a great gateway to exchanging ideas in the future. Kiselev fell in love with the Metropolitan Museum of Art. When I look at paintings, I like to think about scientific problems, he explains. The beautiful compositions help me organize my thoughts into beautiful compositions.